

Using This Flip Chart

Sunspots are the first indicators that a storm from the Sun is a possibility. However, not all sunspots cause problems for Earth. By following the steps in this flip chart you will soon be able to answer the big question, “**Do sunspot regions exist today that could be a source of solar storms?**”

In the flipchart you will find **INSTRUCTION CARDS** followed by **INFORMATION CARDS**.

- **INSTRUCTION CARDS** contain every step necessary to obtain, analyze and record all required online data.
- **INFORMATION CARDS** contain a variety of sample images and helpful tips when interpreting and analyzing the data.

Don't forget to keep your **Data Collection Sheets** nearby in order to collect all of the information you will need to complete your Space Weather News Report!



Kanzelhohe Solar Observatory

1. Open <http://son.nasa.gov/tass/tools.htm> and click on “**Kanzelhohe Solar Observatory**” (live data). The Sun-Earth Media Viewer will open.
2. In the Viewer observe image **#9** for any dark spots called “sunspots” on the surface of the Sun.
3. Refer to your ‘Sunspot Regions Data Collection’ sheet to answer questions **(a)** through **(e)**.
4. Close the current window and return to <http://son.nasa.gov/tass/tools.htm> .

Kanzelhohe Solar Observatory

ABOUT THE DATA:

Image #9 on the Sun-Earth Viewer allow us to look at the sun through a ground based telescope using a special Hydrogen-alpha filter. These filters allow us to look safely at the Sun by filtering out all light except a specific wavelength of red light. These particular images of the Sun are updated every day if viewing conditions are good.

ANALYSIS TIP:

The size and position of sunspots can tell us about solar activity that might produce solar flares and coronal mass ejections.

NAVIGATION TIP:

With the Sun-Earth Viewer you can use the controls under the large box on the right to zoom and pan. This feature allows you to see sunspots on the Sun in great detail. Some small sunspots may not be visible until you zoom. If you zoom in and pan down to the left, you can see the exact date and time of the image. It is important to check the date and time because the images are not updated if viewing conditions are poor (cloudy) at the Kanzelhohe Solar Observatory.

Live Data and Tutorials
<http://son.nasa.gov/tass/tools.htm>



SOHO MDI with numbers

1. Click on “***SOHO MDI with numbers***” (*live data*) and observe image #7.
2. On your ‘Sunspot Regions Data Collection’ sheet answer question (f) by drawing any sunspots that you observe. Also, include any given sunspot region numbers.
3. Close the current window and return to <http://son.nasa.gov/tass/tools.htm> .

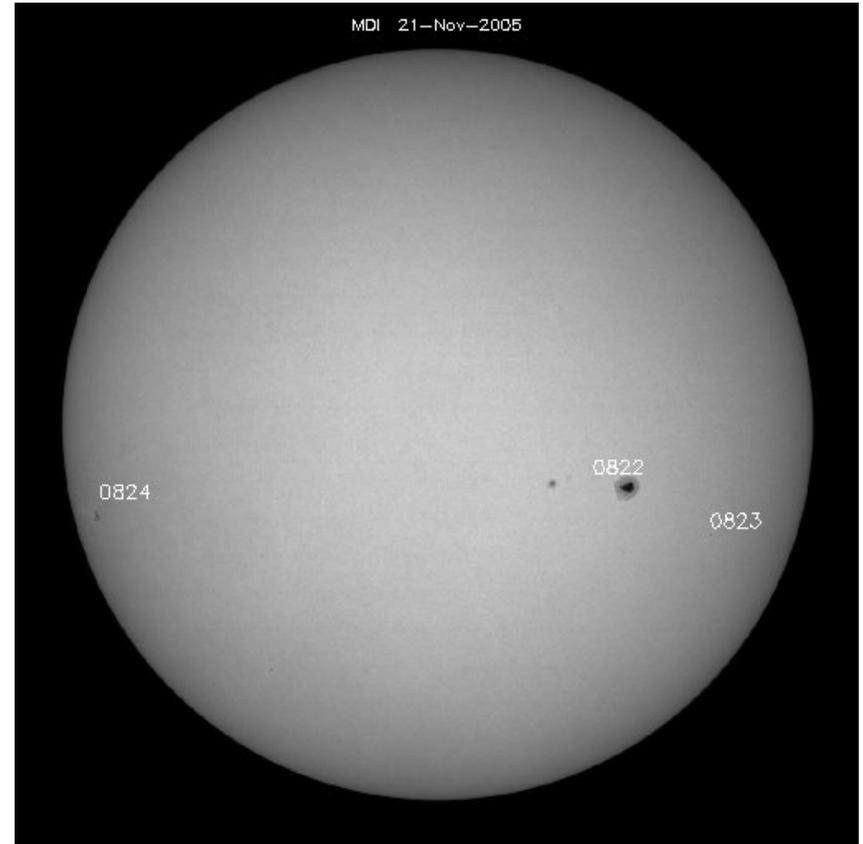
SOHO MDI with numbers

ABOUT THE DATA:

“SOHO MDI with numbers” show black and white SOHO MDI images with sunspot numbers printed next to the sunspots. Each sunspot region is given a number by scientists to help them communicate with each other better.

ANALYSIS TIP:

You should use these numbers as you refer to sunspots in your reports.



Live Data and Tutorials
<http://son.nasa.gov/tass/tools.htm>



SOHO Magnetogram

1. Click on “**SOHO Magnetogram**” (*live data*). The data will appear as an image from the *SOLAR AND HELIOSPHERIC OBSERVATORY* website.
2. Answer question (g) on your ‘Sunspot Regions Data Collection’ sheet.
3. Close the current window and return to <http://son.nasa.gov/tass/tools.htm>

Observation Note:

When black and white areas within an observed region of this image are clearly separated, there is less chance of a solar eruption. When they are mixed together, there is a better chance for a solar eruption from that location.

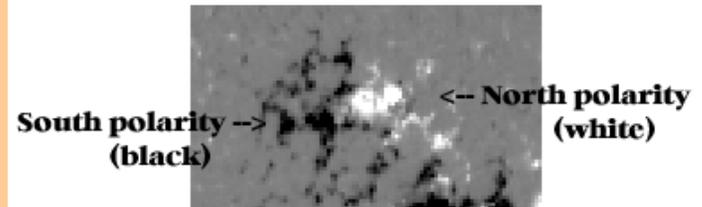
SOHO Magnetogram

ABOUT THE DATA:

The fields and forces of magnetism are invisible to our eyes, so how can we see them? The MDI instrument aboard the SOHO spacecraft 'can' detect the strength and locations of magnetic fields on the Sun and represent that information in specialized images called magnetograms. These images demonstrate the intensity of magnetic twisting in the solar photosphere.

ANALYSIS TIP:

Think of a bar magnet. One end of a bar has a north magnetic pole and the other end has a south magnetic pole. In a magnetogram white areas show regions of north magnetic poles while black areas show regions of south magnetic poles. The gray color shows an absence of magnetic fields.



The areas of black, white, and gray are artificially colored to represent the magnetic field lines.



SOHO EIT

1. Click on “**SOHO EIT**” (*live data*) and observe images #1 through #4 in the *Sun-Earth Viewer*.
2. At certain times the SOHO EIT images will be inactive due to instrument recalibration and you will see the words “CCD BAKEOUT” over the EIT images. When this happens refer to image #12 (TRACE) in the *Sun-Earth Viewer*.
3. On your “Sunspot Regions Data Collection” sheet answer question (h) .
4. Close the current window and return to <http://son.nasa.gov/tass/tools.htm> .

SOHO EIT

ABOUT THE DATA:

Images #1 through #4 in the Sun-Earth Viewer show images from the SOHO EIT instrument (Extreme ultraviolet Imaging Telescope). EIT uses filters to allow the camera to record only particular kinds of ultraviolet light. Ultraviolet light is invisible to our eyes and has no color as we know it. These images are artificially colored to help scientists know what filter was used.



ANALYSIS TIP:

Bright spots in these images tell you that there is a lot of ultraviolet light being emitted. Dark regions show little activity. You should compare these four EIT images to each other and to the SOHO MDI image that that you observed earlier.



SOHO LASCO

1. Click on “**SOHO LASCO**” (*live data*) and view images #5 and #6 in the *Sun-Earth Viewer*.
2. Refer to your ‘Sunspot Regions Data Collection’ sheet to answer questions (i) through (k).
3. Close the current window and return to <http://son.nasa.gov/tass/tools.htm> .

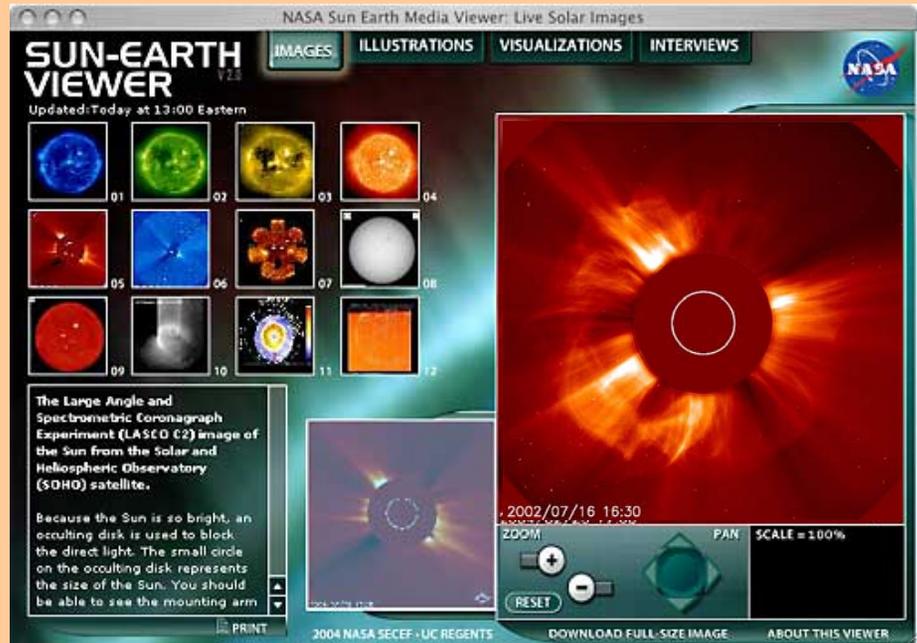
SOHO LASCO

ABOUT THE DATA:

LASCO (Large Angle Spectrometric Coronagraph) is able to take images of the solar corona by blocking the light coming directly from the Sun with an occulter disk (the dark circle in the center of the image), creating an artificial eclipse within the instrument itself. The position of the solar disk is indicated in the images by the white circle.

ANALYSIS TIP:

The most prominent feature of the corona is usually the coronal streamers, those nearly radial bands that can be seen both in LASCO images (#5 and #6).



This is a classic image of a "halo event", so called because the circular area of the edges of the blast seem to form a kind of halo around the Sun. This can indicate that a storm is headed directly towards Earth.

